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ABSTRACT

A study was conducted to provide the data necessary to make informed policy and leadership decisions about the future operations of the Texas Education Network (TENET), a telecomputing network for education. Section 1, "Teaching and Learning with TENET" (Jane L. David), addresses issues of teaching and learning through the use of focus-group data from TENET users and the results of a survey of 408 users. Users were enthusiastic about TENET but identified problems with its use. Section 2, "Online TENET User Survey" (Gloria G. Frazier), describes the results of the same online survey and analyzes responses to specific questions. Section 3, "TENET in the Larger Context" (Deneen Frazier), compares TENET with other statewide networks in Pennsylvania, Florida, Virginia, and West Virginia and discusses it in the national context. Recommendations from these three studies suggest that TENET, to maintain its place as a leader in statewide telecommunications, should keep abreast of National Research and Education Network (NREN) developments, monitor its hardware and software, and provide links between local and wide-area networks. Monitoring of technical support and training and new opportunities for discussion are needed, along with increased staff and a formalized governance model. A chart compares TENET with other networks. (SLD)

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TENET AFTER ONE YEAR

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Overview

The intended purpose of the study was to provide data to persons responsible for making informed policy, leadership and management decisions regarding the future operation of TENET. The information was gathered from a variety of sources during the period 5/15/92 through 11/15/92. Subjective and objective data gathering techniques were employed, and observations and recommendations are based heavily on both types of information.

The study consists of three primary sections, each unique in its approach to describing the status of The Texas Education Network (TENET) after a year of operation:

Section One was prepared by Dr. Jane David, Bay Area Research Group, Palo Alto, CA, and addresses issues of teaching and learning based on data gained from TENET users during focus groups facilitated by all members of the study team and from the results of a user survey administered on line.

Section Two was prepared by Dr. Gloria G. Frazier, WEB Associates, Naples, FL, the prime contractor for the study, and is an explication and discussion of the results of the online user survey which presents implications of the results and suggestions for further investigation. This section contains an item by item commentary with visual representations.

Section Three was prepared by Deneen Frazier, AtWork Networks, Arlington, VA, and is a comparison of TENET with other statewide networks together with a discussion of TENET in the national context. Included in this section is a matrix comparison of TENET with four other statewide telecommunications networks serving their respective education communities.

Conclusions in the form of recommendations are presented at the end of the study. These conclusions are drawn from the information gained as a result of the study and are filtered through the professional knowledge and experience of each of the preparers.

TEACHING AND LEARNING WITH TENET

Jane L. David, Ed.D.
Bay Area Research Group

Within a few months of its introduction, educators' use of TENET vastly exceeded even the highest expectations. Before the end of TENET's first year in existence, over 10,000 educators signed onto the system according to the Texas Education Agency (TEA). This response attests to the speed with which TEA launched the system, putting in place the hardware and software as well as training and support for users, and attracting users to the system. The remarkable response also attests to the value offered by TENET; educators sign on because it is valuable professionally.

TENET is intended to facilitate learning and communication for educators and students. It is based on a vision of telecommunication technology as a powerful tool for student learning, teacher and administrator professional development, and increased productivity and efficiency in communication--up, down, and across all levels of the public school system.

This report focuses on how teachers are using TENET to enhance student learning. TENET is one of several potentially powerful technologies able to help educators equip students with the knowledge and thinking skills they will need to function as productive citizens in the upcoming century. But the potential of such technologies is realized only when educators have access to hardware and software and access to the knowledge and skills needed to use the technology in ways that transform learning experiences for students.

TENET has the potential to provide such access. Through the capabilities of electronic mail, conferencing, access to databases, news sources, and other networks, educators can communicate with each other and stay abreast of the latest best practices in their field. Similarly, students can have direct access to simulations designed to stimulate thinking and problem solving skills, vast libraries of information, experts, and colleagues across Texas and the country. Telecommunications can overcome problems of teacher isolation within schools, communication with colleagues across schools and districts, separation of teachers and administrators, administrators at different levels of the system, and limited on-site resources such as library books.

The findings described are based on face-to-face interviews, an online survey posted on TENET, telephone interviews, school-site interviews, and observations of videos created by school sites. The interview sample included over 200 educators attending a national technology conference held in Texas during July, 1992. These educators, who volunteered to be part of our sample, included teachers, school and district administrators, regional service center staff, and TEA staff. The survey responses are a non-random sample of 408 TENET users--those who chose to respond. These data were enhanced by selected online follow-up questions.

The sample is purposefully biased towards early adopters--leading edge educators who tend to be among the first to experiment with innovations. By focusing on those who have used TENET the most, we were able to maximize lessons about both the strengths and weaknesses of TENET in its first year. Future evaluations will require a more representative sample of all types of users.

From these data, a clear picture of the first year uses and usefulness of TENET emerges Overall, TENET has been received with unabashed enthusiasm, in spite of educators' unfamiliarity with telecommunications, limited availability of training, and some technical limitations of the system For students and teachers alike, it opens a new and constantly growing world of information and colleagues The combination of introductory training from the regional centers and on-line support eases access for many teachers, even those inexperienced with computer technology

Teachers are the primary users of TENET, they use TENET for learning activities with students and for their own professional development and productivity Administrators use TENET for both productivity and administrative purposes as well as for providing staff development and other support for teachers Over half of the survey respondents reported using TENET more than three hours a week and 40% of those reported more than nine hours weekly use Over 70% of the survey respondents sign on at least once a day Half of these occur from the workplace, typically after school, and half from home On a seven-point scale describing the usefulness of TENET from 1 = "useless" to 7 = "has revolutionized my work", 92% of the respondents ranked TENET as 6 or 7 In a similar vein, 70% report that they have used TENET more often than they expected to when they originally signed up

We have chosen to use many of the respondents' own words to communicate how teachers and administrators use TENET and their attitudes towards it The responses were remarkably consistent, therefore the examples and quotations represent a class of responses and are not unique in their content

We look first at how teachers are using TENET directly with students and how TENET changes the kinds of teaching and learning in classrooms We then turn to the ways in which TENET provides direct benefits to educators, through professional development and increased productivity, which makes possible changes in curriculum and instruction Finally we discuss the barriers to more extensive uses of TENET as TENET moves from its infancy to a fully effective system for all educators

Instructional Uses of TENET

Teachers and other faculty members offered a wide variety of examples of instructional uses of TENET with students across all grade levels, subjects, and all kinds of students including handicapped and gifted Teachers often cited uses around current events and their ability to access up-to-the-minute information, news, as well as download materials and ideas for lessons plans on current news For example, in a number of classrooms around the state teachers used TENET for a unit on space during shuttle lift off They got up-to-the-minute data from NASA over the network Students went home able to show off to their parents because they had learned the facts before their parents

The immediacy of the information, and the fact that it is real, appeals to students and teachers In one class, students, looking up whether there had been any earthquakes recently, found one was occurring at that very moment *It became a living breathing subject TENET has helped with motivation for student and teacher*

Classes also engage in simulations not logistically possible without electronic connectivity For example, one school had an economic summit on TENET where students, teachers, county judge, university faculty all asked and answered questions about economics on line *We saw how excited the kids got!* In another school, teachers

noted that they were isolated and could not afford the time or money for field trips *TENET helps connect us to the rest of Texas. We are saving money and going more places with TENET.*

Teachers, administrators, and students enjoy immediate access to information on what is happening in the State Legislature and reports on State Board of Education activities. Both teachers and students find that TENET vastly increases access to research materials; this is especially appreciated in small schools where libraries have limited collections.

> *I can communicate effectively with other [educators] about any topic. I gather expert advice from others who have tried methods and learned from their mistakes. The students and I can travel to other places without ever leaving my library and obtain much more information. I don't think I could do without TENET now that I have had the wonderful opportunity to work with it.*

Teachers commented that students take more care with their writing when they are going to transmit something electronically. Electronic communication encourages students to practice and improve writing skills.

> *I have seen children's writing improve. One student said, "You have to spell right or your friend can't read what you say!" I think our children are learning how to learn. They are keeping current on events. They are learning to think, to draw conclusions, to see the world in a different light.*

Moreover, students feel differently about themselves when they communicate as an invisible party. Students may find themselves tutoring adults--even teachers; students become experts which in turn leads to increased self-confidence. This fact is particularly salient for students whose physical characteristics have led to uncomfortable or negative reactions in face-to-face encounters, for example.

> *TENET is equally available to ALL children. Our handicapped children as well as our gifted and talented students can use TENET. We have one child with a physically deformed body. She has a key-pal. To her key-pal she is just a beautiful third grader who loves life and is a joy to know. She feels so very important because she feels she is very special to someone. They love to write. For all we know, many of our children may be writing handicapped children.*

> *I've used telecommunications with blind students. They need adaptive equipment to read the screen and produce information in Braille. It's wonderful. Most of the time they do not identify themselves as blind.*

Respondents also gave examples of problem solving made possible through communication with other individuals or groups in other schools with similar problems. For example, in one school students and faculty were concerned about disruptions that had occurred during the previous year's graduation. Through TENET, students and teachers communicated with their counterparts in another school that had experienced similar problems and solved them. *It brings schools together.*

The examples of instructional uses cited by teachers are as varied as their situations. Teachers also emphasized that the more they become familiar with TENET, the more ways

they discover to use it. From mentors for students to real-time science experiments to adult penpals for students with language or mental impairments, the uses are seemingly endless. *I seem to develop more uses each day as I continue to learn more about the real potential that TENET offers the classroom teacher.*

EXHIBIT 1

TENET: A POWERFUL INSTRUCTIONAL TOOL

How can a modem and some extra telephone wire transform learning opportunities for students? Teachers cited a range of uses of TENET with their students including:

* access to information otherwise unavailable
* access to current, unfolding events worldwide
* ability to download instructional materials
* simulations to enhance thinking and real-world skills
* research projects
* access to expert advice
* immediate feedback
* opportunities for practice (especially writing)
* collaborative problem solving
* access to people around the world

An educator from a Regional Education Service Center offered a compelling description of the instructional power of TENET in the context of goals for student learning in Texas:

Our Commissioner of Education has charged us with providing an education that is equitable and involves "real-world skills." Since we are trying to prepare kids for a world of which we can't conceive, our job as educators MUST be to teach kids how to learn, how to access information, and how to accept change. TENET is certainly a tool that can help us with these and is indeed a real world skill. Additionally, TENET can help us address the issue of equity of resources in Texas. Many of the school districts in my region are small and lack the resources and specialized personnel of the larger districts. TENET can help balance those scales. The smaller districts can now access NASA, leave messages for the astronauts, browse around in libraries larger than any they will ever be able to visit, do research in states/countries that they can even dream of visiting, discuss the super conducting supercollider project with the physicist in charge, discuss world ecology with students in countries around the world, read world and national news that appears in newspapers that are not available in their small towns, work on projects as equals and collaborators with those in urban areas, and change the way they feel about the size of their world. This will create students that we could not create otherwise. This is a new education and instruction.

Teacher Development and Productivity

The kinds of instructional uses of TENET described above are only possible when teachers have access to TENET, have the knowledge to use it in exciting instructional ways, and have the time to take advantage of these opportunities where they exist. Therefore, the key to future widespread changes in teaching and learning is access to learning opportunities and time for teachers.

Regional Education Service Center staff provide training for teachers on how to use TENET through introductory workshops and follow-up support. The quality of both varies by region, according to our teacher respondents, and on the support of district and school administrators. Training opportunities are also constrained by the availability of equipment. Despite such problems, teachers demonstrate commitment to learn to use TENET, for example:

> In a small rural district, eight teachers scrambled to gather enough equipment to support a day of training from the Regional Education Service Center (ESC) representative. One teacher brought a modem from home, another brought 200 feet of phone wire. They strung the wire down the hall and connected three computers to the modem and phone line so that the ESC trainer could teach them how to use TENET.

TENET provides opportunities for professional development which fit the characteristics of best practices in adult learning: access to colleagues, models of exemplary lessons, access to expert advice, and, most importantly, access to all the above when needed, not at a pre-specified, scheduled time at a remote location. *[TENET] has enabled me to share ideas, problem solutions, and experience with a number of educators both in Texas and across the country.*

Teachers are able to post questions and receive answers from colleagues across the state and beyond. Teachers can consult with each other on ideas for lessons and experiences with particular approaches. In fact, given how isolated teachers are from each other in classrooms during the school day, it is easier to consult with colleagues via TENET because time and place no longer matter. Moreover, the definition of immediate colleague shifts from one's school to a much larger set of teachers across the entire state and beyond. Teachers also participate in ongoing discussions around current topics from curriculum development in social studies to issues in restructuring schools. For teachers in small rural schools, the opportunity to exchange ideas with colleagues becomes a reality for the first time. *It's hard for our rural school to have up-to-date materials. TENET has helped me learn about materials that I can use with students that other teachers say are good.*

Teachers can keep up with the latest practices in education through exchanges with other teachers, involvement in discussion groups, scanning of new materials, access to libraries and other information sources for learning and for conducting research. *I have found a revitalization in my own teaching process that I attribute to utilizing TENET.*

TENET also serves as an efficient form of communication to announce particular events and staff development activities. Activities can be scheduled quickly because announcements can be distributed instantaneously. Regional Education Service Center staff describe increased communication between ESC and district staff, and among ESCs.

as a major benefit of TENET. TENET also facilitates communication among teachers and administrators in the same region.

Teachers and administrators enjoy the access TENET provides to legislative and state board of education updates, professional association information, as well as educational developments across the state. Many cited increased awareness of and participation in policy discussions and legislative affairs concerning the Texas education community.

Asked how TENET was useful, one teacher described a range of ways in which TENET increased his own teaching ability:

- *It offers me many interesting ideas to bring to the classroom*
- *It offers me up to date information to supplement dated textbooks*
- *It broadens my understanding of world affairs*
- *It keeps me abreast of the latest developments in education*
- *It connects me with people all over the world*

In the comments offered were descriptions of a number of ways in which TENET stretches available time--partly by inspiring extensive at-home use and partly by increasing productivity. Teachers and service center staff developers report extensive home use of TENET. However, the extensive at-home use reflects users who have their own computers and modems at home--which is not the case for the vast majority of teachers and administrators. Nevertheless, some teachers have purchased their own modems in order to have access to TENET at home because access to school is limited by the lack of phone lines. Typically, teachers must go to the library or the office to have access to a phone line and modem.

TENET also increases productivity by providing more efficient ways to communicate which in turn frees up time for activities tied more directly to teaching and learning. The ability to plan and notify people of events saves time as well as money, both can occur without the costs of meeting time, travel, and postage costs. Telephone tag is replaced by the ability to receive and send messages when convenient. Staff developers noted their ability to respond individually to educators' questions within a day because TENET gave them access to people well beyond and before the school day. Moreover, their access to people was not dependent on their physical location.
Because of the size of the regions, ESC personnel reported increased opportunities to service the districts for which they were responsible without curtailing their travel schedules or daily responsibilities. This feature is equally appealing and reassuring to instructional personnel when the need for a classroom substitute arises.
One teacher described her use of TENET to communicate daily with her class and with the substitute teacher while she was away:

> *I had to be [away] for a week to take my son to a specialist... I needed to be able to communicate with my substitute, to keep up with my classes and to send completed lessons to them. We used the e-mail of TENET to transmit questions my students had, as well as questions that my substitute had to me. I answered and returned them as well as other assignments, hints on programs, and test questions back. I checked in three times daily during that week I was away from my classroom.*

EXHIBIT 2

ENSURING A QUALITY WORKFORCE THROUGH TENET

Developing real-world skills and reaching world-class standards requires a major transformation in how teachers teach and how administrators support those new ways of teaching and learning. Traditional forms of professional development, based on a limited workshop training model, do not address the need for teachers and administrators to learn to do their jobs in dramatically different ways. For teachers to create learning environments that actively engage students in meaningful tasks, they need access to examples of best practices, curriculum content, and the experience of colleagues--and the time to learn and to communicate. Administrators need ways of understanding the kinds of supports teachers need; ongoing communication with teachers is critical for this understanding. Similarly, for districts to function as effective organizations, they need easy access to information, each other, and their counterparts across the state and in the TEA. TENET carries the potential to create a quality workforce and enhance productivity through increased and more efficient communication and through opening new avenues of professional development to teachers and administrators in ways not possible under existing top-down models of training. Already educators have cited innumerable ways in which TENET has contributed to their professional growth and efficiency.

TENET INCREASES PROFESSIONAL DEVELOPMENT OPPORTUNITIES

* exchange ideas
* solve problems with colleagues
* share experiences
* consult with colleagues anywhere
* join discussions on restructuring and other current topics
* create curriculum
* scan new materials
* access libraries
* access state and association information
* access Regional Education Service Center staff
* access current events

TENET INCREASES PRODUCTIVITY

* communicate more efficiently (no telephone tag)
* eliminate travel time (to library, to colleagues)
* speed up notification of events
* receive individually tailored answers to questions
* communicate in new ways in real time
* stretch available time through at-home access to TENET
* download curriculum materials
* stay up-to-date on district and state actions

Barriers to Use

Although TENET holds enormous potential, as illustrated by the variety of effective uses already discovered during its first year, there are barriers that must be overcome to realize its full potential. These barriers are of three broad types: technical, access, and traditions. These categories of barriers are intertwined; for example, solving the problem of having phone lines in the classroom may require administrators to think very differently about what teachers do.

Technical Barriers

The technical barriers are in some ways the easiest to solve. TENET users complained about the limitations of Kermit, especially for downloading information, and its ability to interface with other software programs. Users would like to see TENET supported by multiple protocols. TENET's current structure also does not support simultaneous group conversation desirable for brainstorming and decision making.

Users also noted that phone lines are often busy, suggesting the need for more lines. Some had complaints about speed, although many attributed the slowness to their modem, not the system. A few noted that TENET communication is easily disrupted by storms.

In spite of these complaints, technical barriers did not discourage people from using TENET. In fact, very few described TENET as too cumbersome or difficult.

The following section puts these barriers in the context of other telecommunications systems and projects the future technical demands that TENET will face.

Access Barriers

Educators cannot take advantage of TENET if they do not have access to it. Access includes having both the necessary equipment at hand and the necessary know-how. At a minimum, educators need a computer, a modem, a phone line, and initial training. Yet in most schools, this is not available, and where the hardware exists, it is not readily accessible to teachers. For example, there may be only one phone line and one modem in the main office or library. Ultimately, teachers need access in their classrooms as do administrators in their offices.

Introductory training is usually available through the ESC to those who request it and are willing to go to some lengths to acquire the necessary hardware for hands-on learning. Users, however, suggested a need for two or three different phases of training. First, background information and guidance on how to get set up. Then, an introductory hands-on session on how to use TENET, preferably at the school site with the equipment that will be used. Then, after some independent use where problems are inevitably discovered, a follow-up on-site session. With experts--and more experienced colleagues--to answer questions online, the rest of the training can occur on an as-needed, individually tailored basis. There appears, also, to be a substantial interest on the part of end users to become more active in creating peer counseling and training structures locally. Many users expressed a strong desire to be empowered to train others at their schools and districts. There was a strong sentiment toward increasing dramatically the incentives and viability for more building and district level trainers.

and training session availability, rather than having to depend on a *circuit rider* from the ESC.

Users also noted that many people with whom they wish to communicate are not yet accessible through TENET; obviously, as more join, this barrier will disappear. A superintendent told the following story:

> A superintendent and an administrator from another district were having a conversation during which the administrator asked the superintendent for a copy of a report he had. The superintendent asked for his TENET address. When he found the administrator didn't have one, he told the administrator he would have to get the report elsewhere since he couldn't receive it electronically.

By far, the biggest constraint on access is lack of time. Lack of time is exacerbated by not having the necessary hardware readily accessible. Obviously, the more convenient the equipment--ideally in the classroom and at home--the less time it takes to use it. But lack of time is also in the nature of teachers' jobs. With responsibilities for students during most of the school day, and daily grading and preparation activities, there is little time to explore the vast sources of information and expertise available through TENET.

Traditions as Barriers

Access and technical limitations are not the only barriers to more, and more effective, uses of TENET. Teachers and administrators are accustomed to certain ways of operating and communicating. TENET offers new and different ways of organizing work, communicating, and learning. Because they are new and different, however, they do not come naturally to people. For example, TENET facilitates communication between teachers and administrators, but for those unaccustomed to communicating it is the barrier of traditional relationships that must be overcome.

TENET has the power to make possible a whole new conception of professional development--one driven by the needs and preferences of those requesting help. Yet for teachers and administrators familiar with only one mode of professional development--usually a menu of workshops-- it takes time to realize that professional development can occur at any time through TENET's ability to provide information and link people. TENET enables teachers and students to independently seek information and expands greatly the universe of people from whom they can get ideas and feedback--from peers to experts.

> *We could never go back to teaching without it. [TENET] has been a wake up call for other teachers.*

Similarly, for teachers trained primarily in direct instruction and other teacher-centered pedagogy, it is traditions of practice that limit their instructional uses of TENET. TENET provides a powerful tool to help teachers, administrators, and students shift their mindsets from looking to be told what to do to creating and sharing solutions.

> *[TENET]...has become a part of life for me. It is one of the things that will keep me from retiring for a long time. It brings a great deal of joy to my life to see the light in the students' eyes and the joy on their faces as they are involved with TENET.*

Telecommunications represents the leading edge of the revolution beginning inside schools across America, but its potential will be realized only as attitudes and traditions begin to shift to encompass a new vision of interactive teaching and learning for the twenty-first century

TENET will make Texas the leader in telecommunication."

ONLINE TENET USER SURVEY

Gloria C. Frazier, Ph.D.
WEB Associates

This section describes data collected by an online survey posted on TENET and by followup online inquiries to selected respondents to clarify, verify and explore responses. Portions of this data were used in anecdotal form or referenced in the previous section of this report.

Survey Instrument and Methodology

The survey instrument was designed as an extension of an existing "Pre-Use Questionnaire" which was voluntarily requested from all TENET users when they registered for the network. It was intended that those submissions would form baseline data with which data obtained from a post-administration of the same instrument could be compared for an identical population. Items were added to reflect the fact that a user had been registered on the network for a period of time, to gain additional insights into areas such as most frequent sign-on location and users with disabilities and to encourage respondents to supply more extended responses and anecdotal data. Items regarding length of time as a TENET user and actual TENET use versus expected TENET use were added after it became clear that because of the way pre-use demographic data was stored it would be beyond the scope of the study to gain post-administration data on the identical group of users who had submitted a pre-use questionnaire. The program administrator and evaluator decided that a random sample from online users would be sufficient to determine a useful user profile without benefit of baseline data.

The evaluation study was designed to profile the most active user group, from whom a substantial amount could be learned regarding the network's acceptance by and usefulness for a broad spectrum of users, rather than attempting a representative sample which, because of the newness of the network, would include a large number of users with minimal or no TENET experience. By gathering the evaluation data online responses from minimal users or users without the skills or equipment necessary to respond online, to download or print the survey were limited. Inexperienced users were given the option of obtaining a survey form by mail or from other sources.

Internal considerations prevented a network-wide announcement of the survey until only two weeks before the close of the survey period. Therefore, the instrument was located online in news groups and conference areas which might not be visited regularly or at all by minimal or incidental users. Shortly before the close of the survey period, it was possible to place a general "banner" announcement which all users encountered when they signed on TENET. The banner generated 200 new responses within two weeks. Another technical enhancement made it possible to mail a request to complete the survey to those who had completed the pre-use questionnaire prior to April 30, 1992, once their e-mail addresses were manually identified from TENET records.

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Survey Results

General Observations

The total number of responses (408) was lower than expected. This may be due to the relative inaccessibility of the survey to other than experienced, frequent users of more than e-mail, considering the relative inexperience of nearly half the user pool at navigating news groups or conferences or downloading files. It is also not clear that all trainers and Regional Education Service Centers actively promoted the survey or encouraged responses.

Although the differences were statistically insignificant, the responses received late in the period after the sign-on banner appeared were from users who had been registered on TENET for a shorter period of time, who rated themselves as infrequent or inexperienced or (the largest percentage increase) from teachers without workplace access to TENET.

Percentage of anonymous responses was lower than expected, based on comparable studies which gave respondents an opportunity to freely address issues.

There were no completely negative responses. Although most respondents identified problems, all respondents offered overall a positive appraisal of TENET's usefulness and viability.

Although the evaluation study is a sample of less than 5% of network users, and the assumption had been made that the sample of presumably experienced and frequent users would be skewed, the demographics of the sample match almost exactly the demographics of the total TENET user population.

Description of Respondents

Eighty-six percent of the survey sample was composed of respondents directly involved with K-12 education, and because those educators are the primary focus for TENET, Table 1 and Graph A examine in greater detail the K-12 respondents.

Table 1 is a profile of the entire survey sample, with an emphasis on the public / private aspect of the responses. The data show clearly that TENET is servicing the population for which it was designed and, at the same time, has been sufficiently accessible by those impacting K-12 education to serve as a unique meeting place for discussion of the needs of the Texas education community.

Graph A compares the school, district and state level responses by four general work category descriptions: curriculum and instruction, administration, clerical and staff and health and human services. The data, again, clearly reinforce that TENET is serving those most closely connected to student learning.

Table 1

PROFILE OF RESPONDENTS*

Public K-12 (86%):

School	54.0%	District	19.0%	State	13.0%
Teacher	44.0%	Sup't./Ass't., Assoc.	3.0%	Regional ESC	8.0%
Library/Resource	6.0%	Administration	6.0%	TEA	3.0%
Principal/Ass't.	3.0%	Curr. Coord.	3.0%	Library	1.5%
Clerical/Staff	.5%	Clerical/Staff	5.0%	Special Schools	5%
Counselor	.5%	Medical/Health	1.0%		
		School Board	1.0%		

% of school respondents

Senior High	58.0%
Jr/Mid/Int	28.0%
Elementary	14.0%

Other K-12 (1%)

Private (.5%) / Parochial (.5%)
Teacher (.5%) / Principal (.5%)

Higher Education (5%)

Public (4%) / Private and Parochial (1%)
Instruction and Research (3%) / Library (1%) / Student (.5%) / Administration (.5%)

Private Sector (2%)

Education Publishing and Consulting (1%), Software (.5%), Aerospace (.5%)

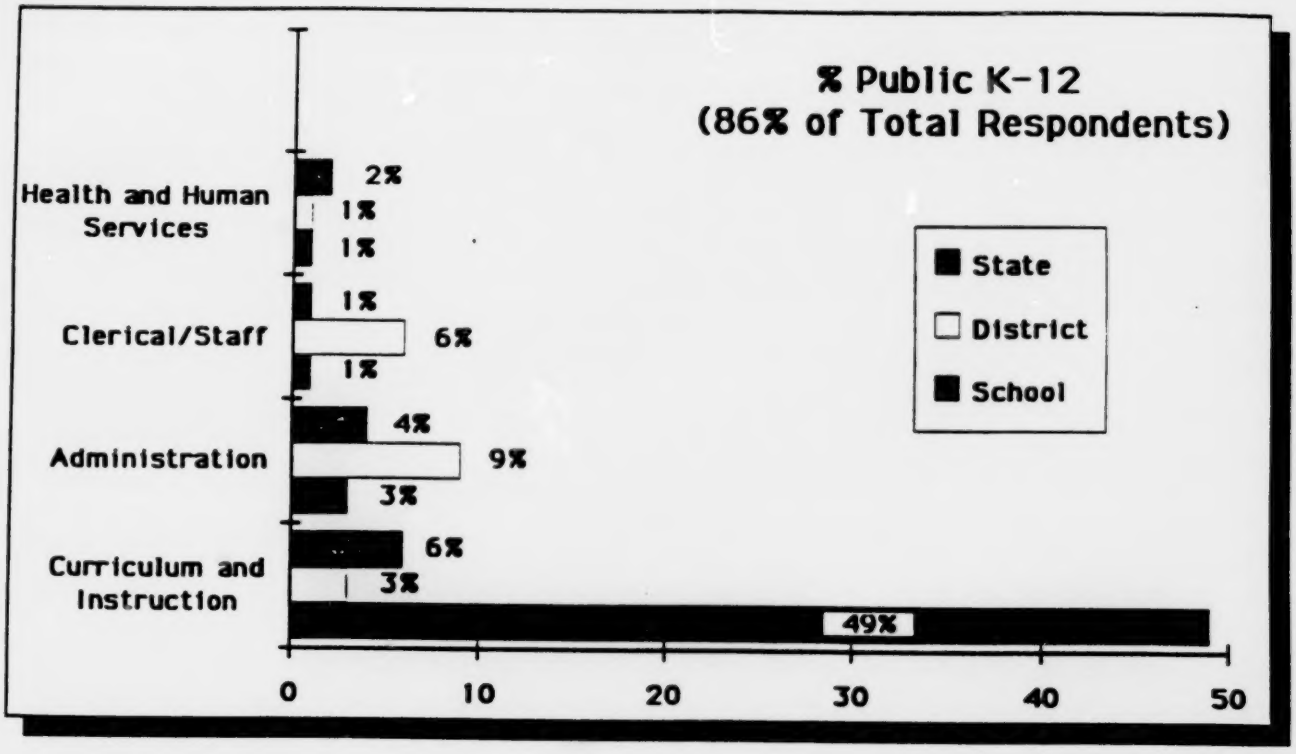
Public Sector (5%)

Local Public Libraries (systems) (2%) / Media (.5%)
Education Affinity Groups, Associations, Organizations (2%)
State Government Agencies and Commissions (.5%)

Anonymous (4%)

* Greater than 100% due to multiple-role respondents

Graph A


% Public K-12
(86% of Total Respondents)
State
District
School
Health and Human Services
2%
1%
1%
Clerical/Staff
1%
6%
1%
Administration
4%
9%
3%
Curriculum and Instruction
6%
3%
49%
0
10
20
30
40
50

Survey Item #1:

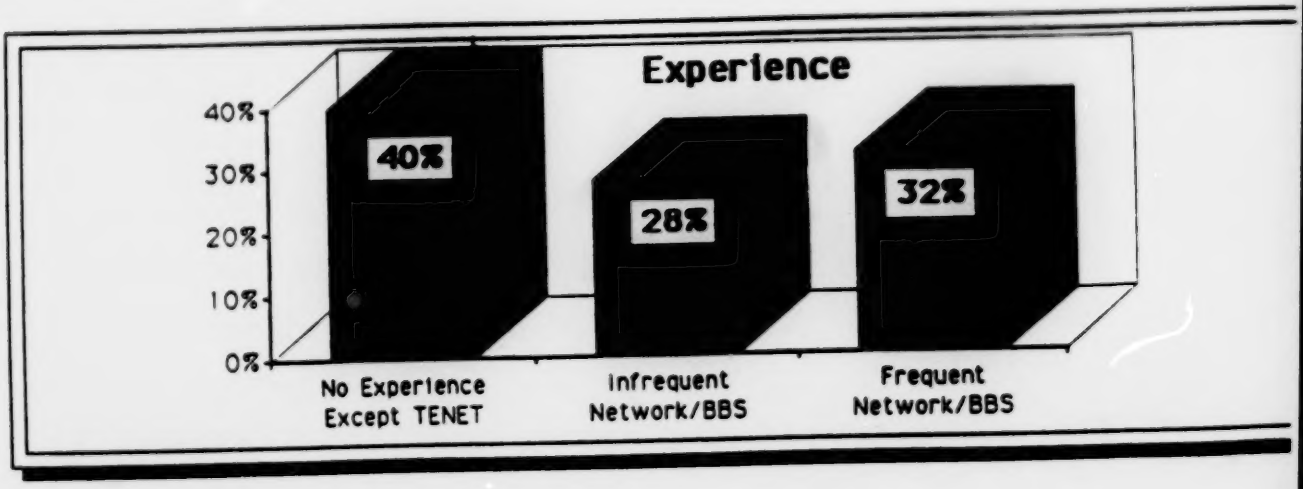
What best describes your experience with computer networks?

40% A No experience except TENET
28% B Infrequent user of another network or bulletin board
32% C Frequent user of another network or bulletin board

These results suggest the need for a substantial TENET training program in order to maximize TENET's usefulness. Since the survey respondents are a proportionally more sophisticated group of TENET users, that means that an even greater percentage of the entire user pool of 15,000 requires extensive training. From previous experience, we know that initial training, delivered while the curiosity and attraction is high, is the most effective to bind the trainee to the activity, while more in-depth training is necessary to ensure that the user moves beyond the more straightforward uses of the network such as e-mail and begins to use the full capacity of the network to support instructional practices. The results from Item 8, where training is cited as the fifth most important limitation to TENET use, seem to bear out the idea that a more random group of users would show an even greater and immediate need for training intervention.

Possible further study: A comparison of "A" and "C" responses to other survey items would yield data regarding the effect of prior experience on TENET use and value.

Chart 1



19

Survey Item #2:

Which features of TENET have been most useful to you? (please rank your selections: 1,2,3,etc.)

1st	A.	Private electronic mail
3rd	B.	Group discussions or conferences
4th	C.	Public announcements or bulletin board notices
2nd	D.	INTERNET resources
5th	E.	Electronic database searches
	F.	Other

The margin of "A" over "D" was more than 2:1, with "B" "C" and "E" tightly grouped. Part of the reason for lack of discrimination between items appears to be that many respondents ranked 1-3, misunderstanding the "etc." directions to rank 1-6. As a result, responses were weighted as if the unmarked responses were the least useful. Despite some items being ranked toward the bottom, all selections received substantial second-place votes. Nearly all "other" responses could fit in A-E. Seven "other" responses were unique, and all dealt with being able to learn about new procedures or systems available to users as a result of being on TENET, e.g., Unix.

Comparison of Item 2 and Item 8 responses suggests a more aggressive effort to expand user communication patterns. This might include a special effort to recruit persons or organizations to be online with conversations/e-mail on issues of the greatest appeal for those already on the network. The anecdotal data clearly suggest that users are talking in role-alike, horizontal groupings, so there is an apparent need to begin intervention programs to get more cross-role and vertical communications. TENET, because of active efforts to recruit a diverse user pool, particularly where affinity groups are concerned, is in a unique position to enhance efforts in site-based decisionmaking and integrated curriculum efforts which require these kind of new communication patterns.

Possible further study: Explore within category preferences with additional inquiries to respondents and by categorizing the anecdotal responses to create a management information document which could be used to guide the development and evolution of existing and additional system features. For instance, many respondents had specific suggestions for conferences or making affinity group participation on the network more useful.

Chart 2

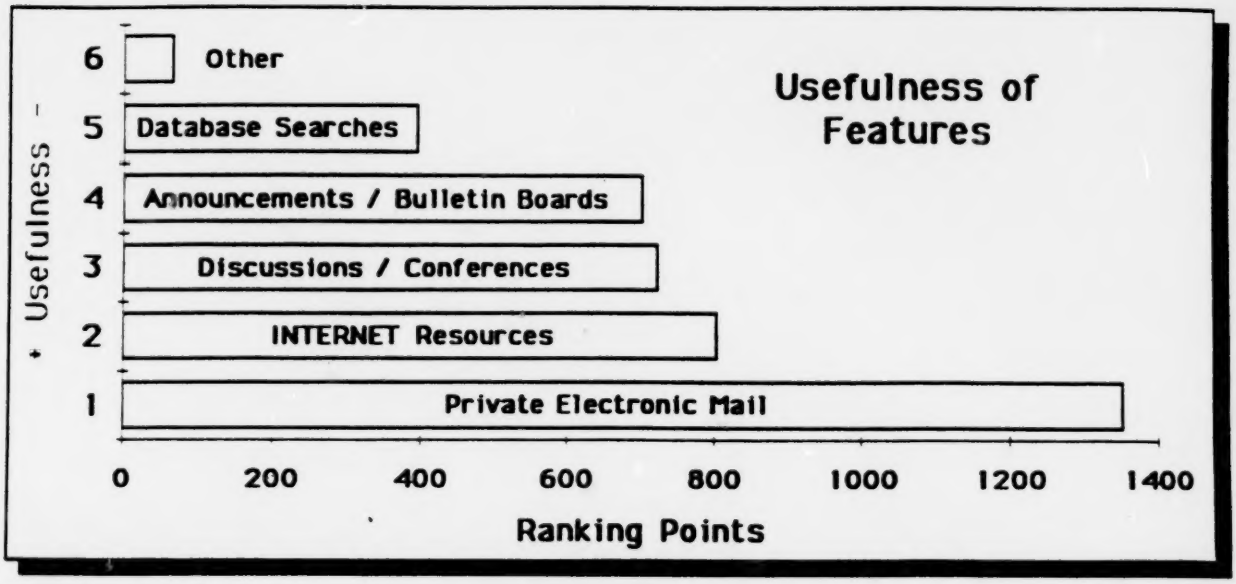
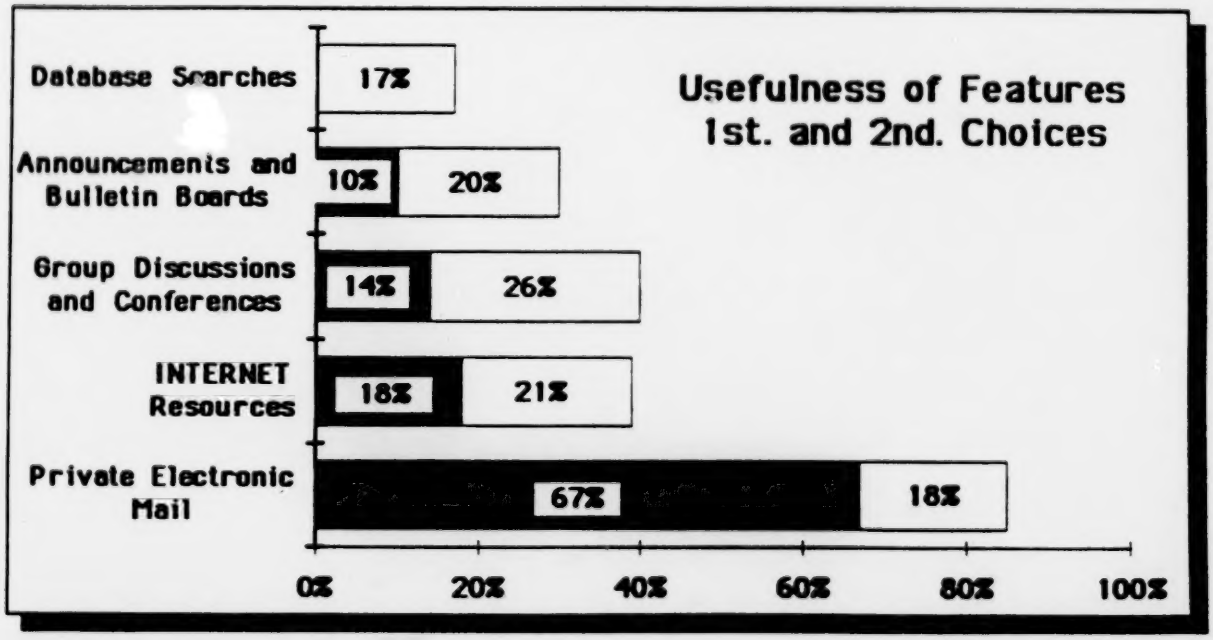


Chart 2A



21

Survey Item #3:

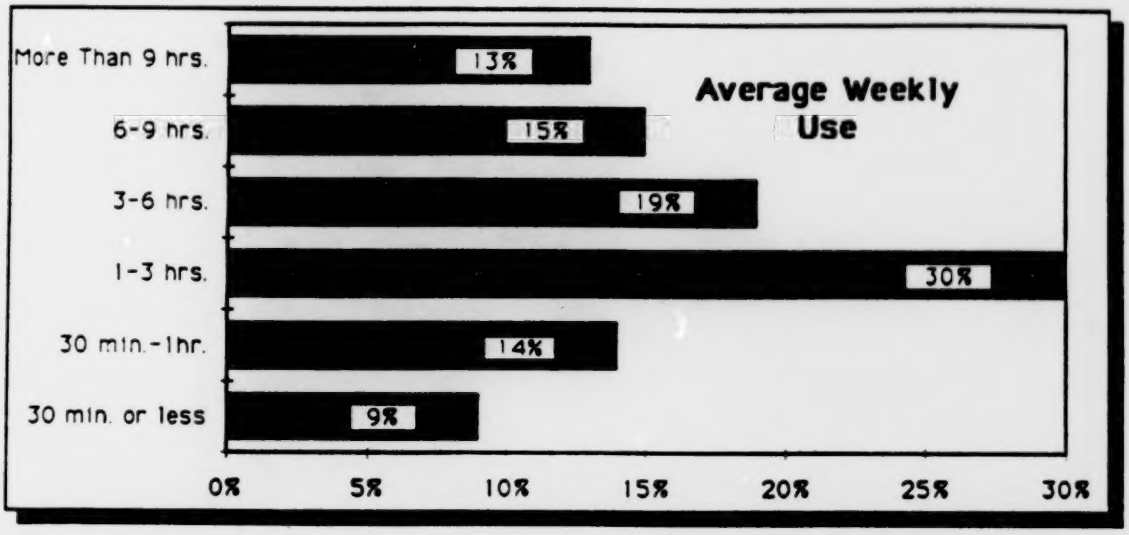
How much time in an average week do you use TENET?

9%	A.	30 minutes or less
14%	B.	30 minutes to 1 hour
30%	C.	1 - 3 hours
19%	D.	3 - 6 hours
15%	E.	6 - 9 hours
13%	F.	more than 9 hours

This was a more even distribution than expected, based on the assumption that the sample was a self-selected sample of high-end users. Item #3 responses, coupled with the responses from Item #4, sends a clear message that system transport and connectivity components will be severely taxed in the near future with the meteoric rise in network enrollments.

Possible further study: Explore whether high-use respondents are also multiple-feature users.

Chart 3



Survey Item #4:

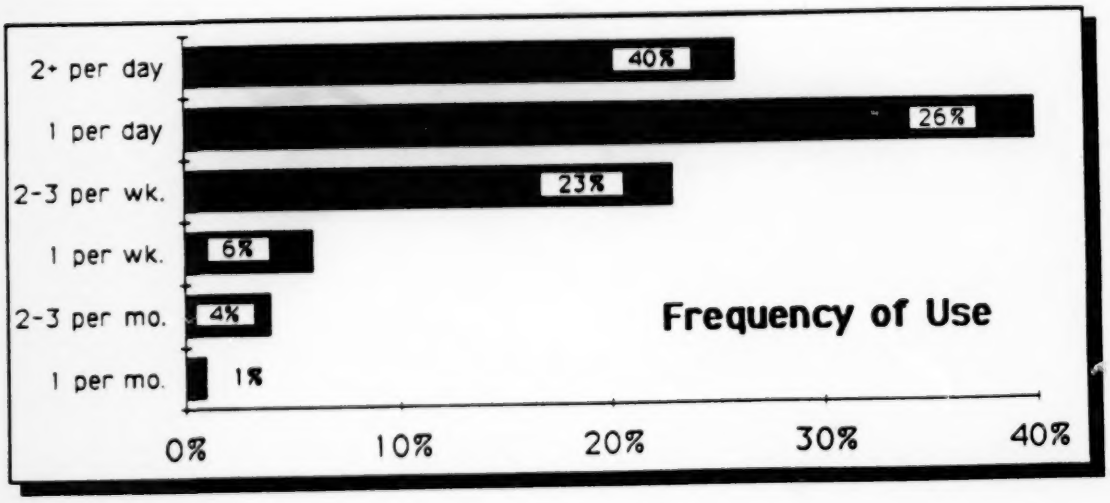
How often do you sign on TENET?

1%	A.	once a month or less
4%	B.	2 - 3 times per month
6%	C.	once per week
23%	D.	2 - 3 times per week
40%	E.	daily
26%	F.	several times per day

It is difficult to understand why there is such a large proportion of daily users and those who reported multiple sign on per day for an admittedly inexperienced user pool. If this really is a representative sample, then it's little wonder that TENET is quickly becoming jammed with traffic, and it would speak to the immediate need to create a managed-access plan for users and their traffic demands.

Possible further study: Explore the reasons for the large jump to multiple uses per week. If it is a function of a learning curve, then large shifts can be expected as the user group becomes more skilled.

Chart 4



23

Survey Item #4A:

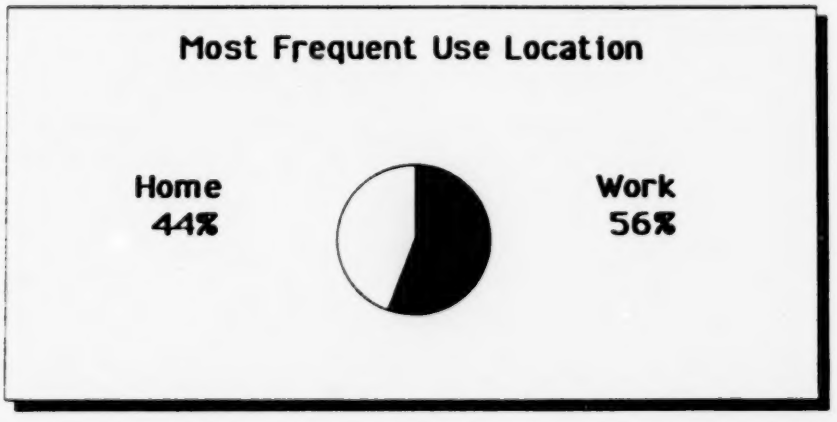
Are most of your sign-ons from your work or home?

56% Home
44% Work

Although the widely-held belief is that schools lack the necessary connectivity to allow teachers to be online from the workplace, this relatively equal response seems to indicate that many more teachers have workplace access than is thought. However, since the survey sample represents high-end users, the result cannot be generalized to all educators in the state. The result is also clouded by the number of respondents who reported nearly-equal use from both access points, a trend which can be expected to grow with the continuing spread of electronic telecommunications in domiciles and which will result in even-greater demand for TENET access at hours which are not now considered prime time. There was strong anecdotal evidence to suggest that access from home does not necessarily occur primarily because access at work is unavailable, but, rather, that it is a preferred access point because of the school day's schedule demands. There was, however, a substantial body of anecdotal data clearly supporting the premise that workplace access is a major problem for many users, administrative as well as instructional.

Possible further study: Explore any differences in the kinds of network activities engaged from each access location.

Chart 4A



24

Survey Item #5:

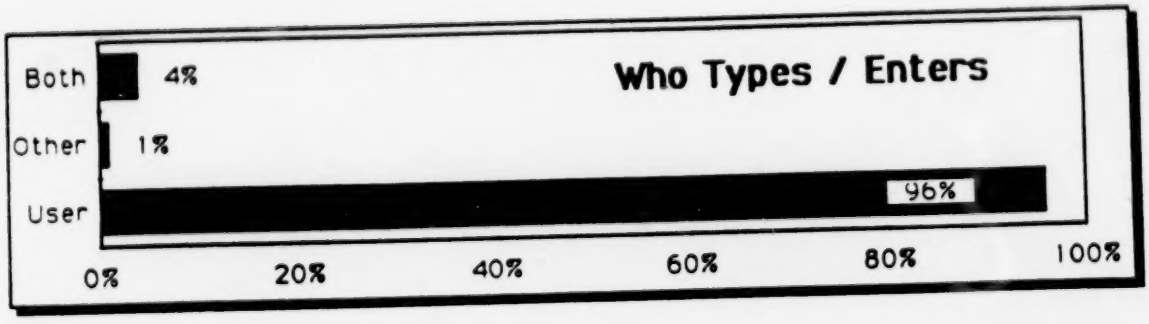
Do you type/enter commands/data yourself?

96% A. Yes, I type/enter myself.
1% B. No, I have someone else type/enter.
4% C. Both A and B

One might assume that a "B" response meant it was by administrators or managers, and that secretaries or administrative assistants were the "someone else". However, nearly all administrators and managers reported performing their TENET online activities themselves. Only in three cases did administrators or managers report otherwise, and those were specifically directed to duties which involved clearing posted notices for information and distribution or posting routine communications. This does not, however, preclude the large number of anecdotal responses from instructional and administrative personnel who decried the fact that their administrators and managers were not TENET users. It would seem that administrators and managers find TENET equally as viable for their work as do instructional personnel once they are introduced to the system, supporting the premise of "Traditions As Barriers" in Section 1 of this report. Those answering "C" were exclusively teachers who cited students as the "B" in their response. There were no reported disabled users who were unable to type/enter data.

Possible further study: Compare use patterns and feature preferences between administrative, instructional personnel and students.

Chart 5



25

Survey Item #6:

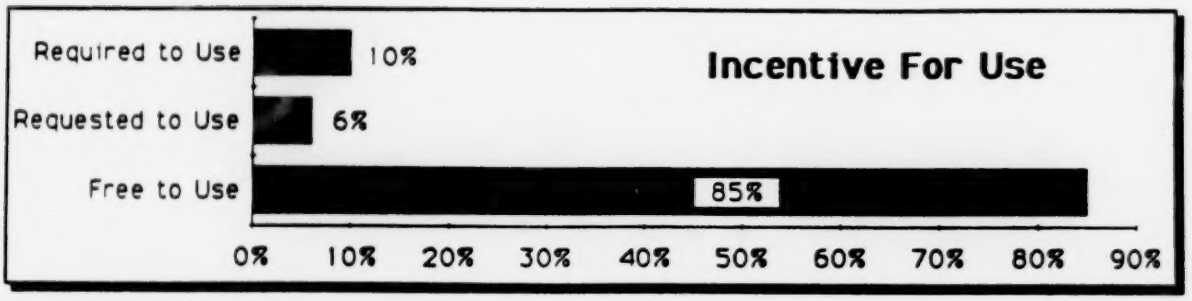
Which statement best describes your use of TENET?

10% A. I am required to use TENET.
6% B. I am requested to use TENET.
85% C. I am free to use TENET as I wish.

This item was designed as an extension of Item #5, searching for expected differences in users based on work roles. It did not yield any new insights. Administrative, staff and clerical users who answered "A" or "B" made it quite clear that they would be on TENET even if it were not a required part of their work role. The anecdotal data strongly indicates that the administrators who are online are actively and personally involved as network participants.

Possible further study: This item does not seem to generate data for continued collection or investigation.

Chart 6



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Survey Item #7:

Which statement best describes your judgment of the worth of TENET?

1%	A	It is useless
1%	B	It is useful for others, but it is not useful for me
2%	C	I am skeptical about it's usefulness for me, but I'm willing to keep trying
1%	D	I am basically indifferent or neutral
13%	E	It has some limited use for me. For example:
58%	F	It is useful for me in many respects. For example:
32%	G	It has revolutionized my work/communications processes. Please explain

Respondents who selected "A" or "B" were adamant about clarifying their responses to be sure it was understood that the responses had nothing to do with TENET, but, rather, were entirely a function of connectivity or logistics, i.e., too many users sharing the same phone line or an inaccessible computer location.

All respondents selecting "C" described themselves as novice users who were overwhelmed.

Respondents selecting "D" reported disillusionment or frustration with their TENET experience.

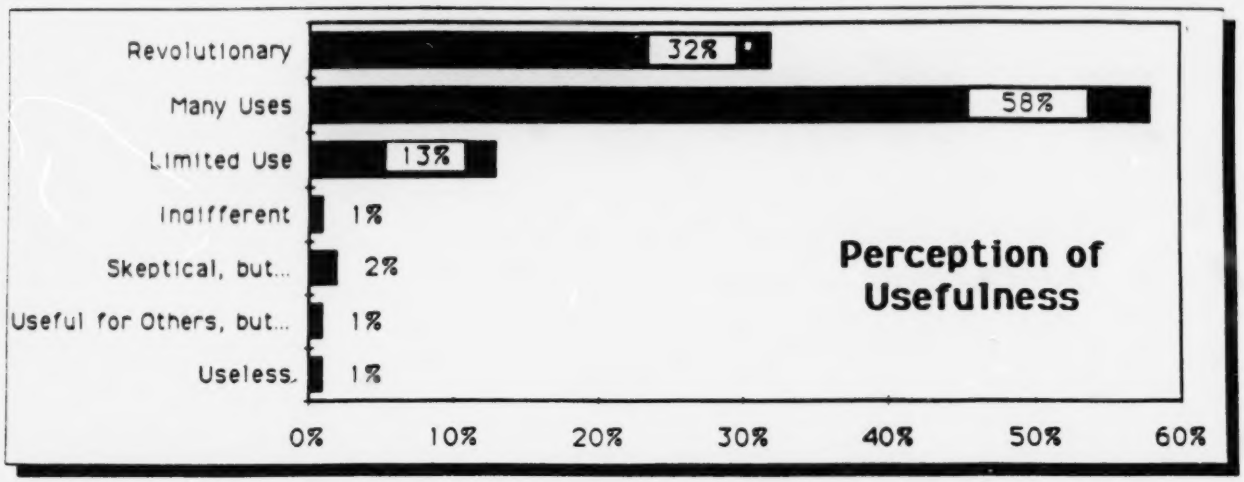
Respondents seemed to have some difficulty discriminating between choices "E" and "F". Since the content of the anecdotal responses accompanying these two selections did not differ at all, it appears the extent to which respondents felt they were accomplished or experienced users determined their choice. In both cases respondents cited specific uses or features that were important to them, and in each case they were enthusiastic about the importance of the uses and features. The number of examples given did not differ significantly between "E" and "F" and in each case the examples described the extent to which users explored the system.

Respondents also seemed to have difficulty discriminating between "F" and "G" since over half of the respondents selected both. The examples provided in response to "F" offered more detailed lists or concrete examples of uses/features, and responses to "G" provided more comments and personal expressions, often about the same lists or examples in their "G" responses.

Of particular interest here is the choice of the word "revolutionized" for the item. Only a few respondents suggested anecdotally that the word overstated the case so much that it discouraged their response beyond the "F" that they chose. In each case, however, they then continued their remarks by citing examples of ways in which they felt TENET had changed their environment in a stronger fashion than they felt an "F" response would indicate. In nearly all cases where "G" was selected, respondents wrote extended comments, the tone and words of which clearly agreed with what would normally be associated with the word "revolutionized."

Possible further study: Analyze and categorize the substantial number of anecdotal responses to "F" and "G" and determine their usefulness for a management information document or inclusion in TENET training and information materials.

Chart 7


Revolutionary
Many Uses
Limited Use
Indifferent
Skeptical, but...
Useful for Others, but...
Useless
32%
58%
13%
1%
2%
1%
1%
Perception of Usefulness
0%
10%
20%
30%
40%
50%
60%

Survey Item #8:

What limits your use of TENET? (Please rank your selections: 1,2,3,etc.)

6th	A	Inconvenient computer location
8th	B	Preference for face-to-face or telephone communication
4th	C	Not enough phone lines
2nd	D	People with whom I wish to communicate are not available or accessible through TENET
3rd	E	TENET is busy
1st	F	Not enough time
7th	G	TENET is too cumbersome or difficult
9th	H	Preference for longhand or dictation
5th	I	Lack of training

The first and second choices of respondents are items which deal most strongly with the human element and meeting the individual needs for integrating TENET into work and lifestyle, making TENET an embedded part of the way in which users conduct their daily personal and professional business. This may have implications for scheduling and work pattern changes which could enhance the opportunities for users to fully integrate the system into their activities. Many respondents offered comments about how TENET allowed them to maximize their time and use it more effectively, so the strong response to "F" may indicate that TENET offers them so much that there isn't time to explore all the options (not unlike the stack of magazines or newsletters which doesn't get read). It seems to be a plea for more time to figure out and use what TENET has made available.

The third and fourth place responses confirm the anecdotal data gathered throughout the survey and in the focus groups in which respondents repeatedly cited connectivity and access as major problems. From most respondents' comments, it appears that the selections did discriminate between the two factors, and that the "C" response refers exclusively to phone lines at the users' points of access.

The sixth ranking response deals with a different kind of access and reflects a large number of comments from users about the location of what was often the one and only computer in a school building. There may be considerations here for building shared-use recommendations for sites to maximize equipment availability or of emphasizing portability in future equipment acquisitions.

The fact that responses ranking fifth and seventh deal with access and training stands in sharp contrast to the anecdotal data in every section of the study and the focus groups where requests for greater access and the need for training are punctuated with myriad war stories. One interpretation is to say that no matter how important these elements may be, the appeal of the system is so strong that respondents will muddle through on their own to learn the system and its features.

Possible further study: Explore with "D" responders who they would like to be able to access on TENET. The comments were substantial about programs or services which were on the "wish lists" of users, but there were few references to individuals or groups.

Chart 8

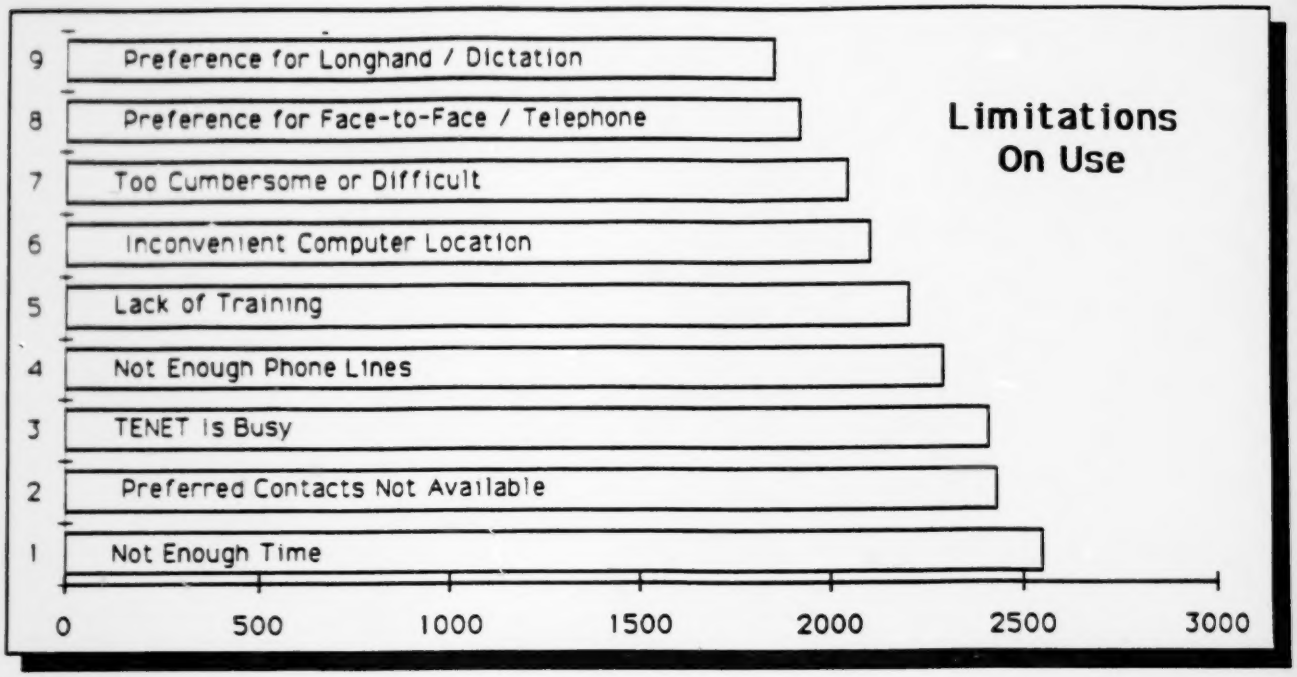
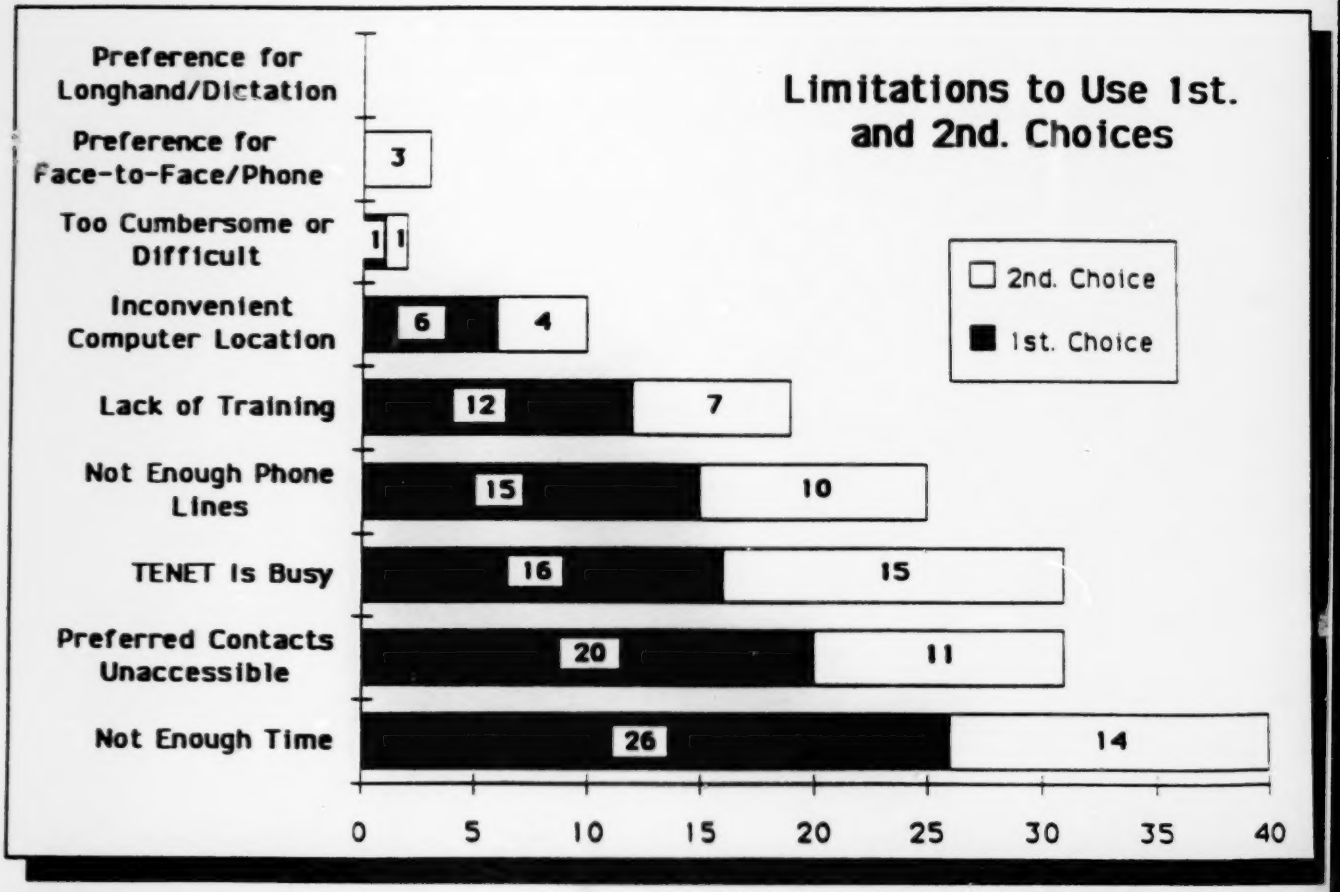

Limitations On Use
9 Preference for Longhand / Dictation
8 Preference for Face-to-Face / Telephone
7 Too Cumbersome or Difficult
6 Inconvenient Computer Location
5 Lack of Training
4 Not Enough Phone Lines
3 TENET Is Busy
2 Preferred Contacts Not Available
1 Not Enough Time
0 500 1000 1500 2000 2500 3000

Chart 8A


Limitations to Use 1st. and 2nd. Choices
2nd. Choice
1st. Choice
Preference for Longhand/Dictation
Preference for Face-to-Face/Phone 3
Too Cumbersome or Difficult 1 1
Inconvenient Computer Location 6 4
Lack of Training 12 7
Not Enough Phone Lines 15 10
TENET Is Busy 16 15
Preferred Contacts Unaccessible 20 11
Not Enough Time 26 14
0 5 10 15 20 25 30 35 40

Survey Item #9:

What would make TENET more useful for you?

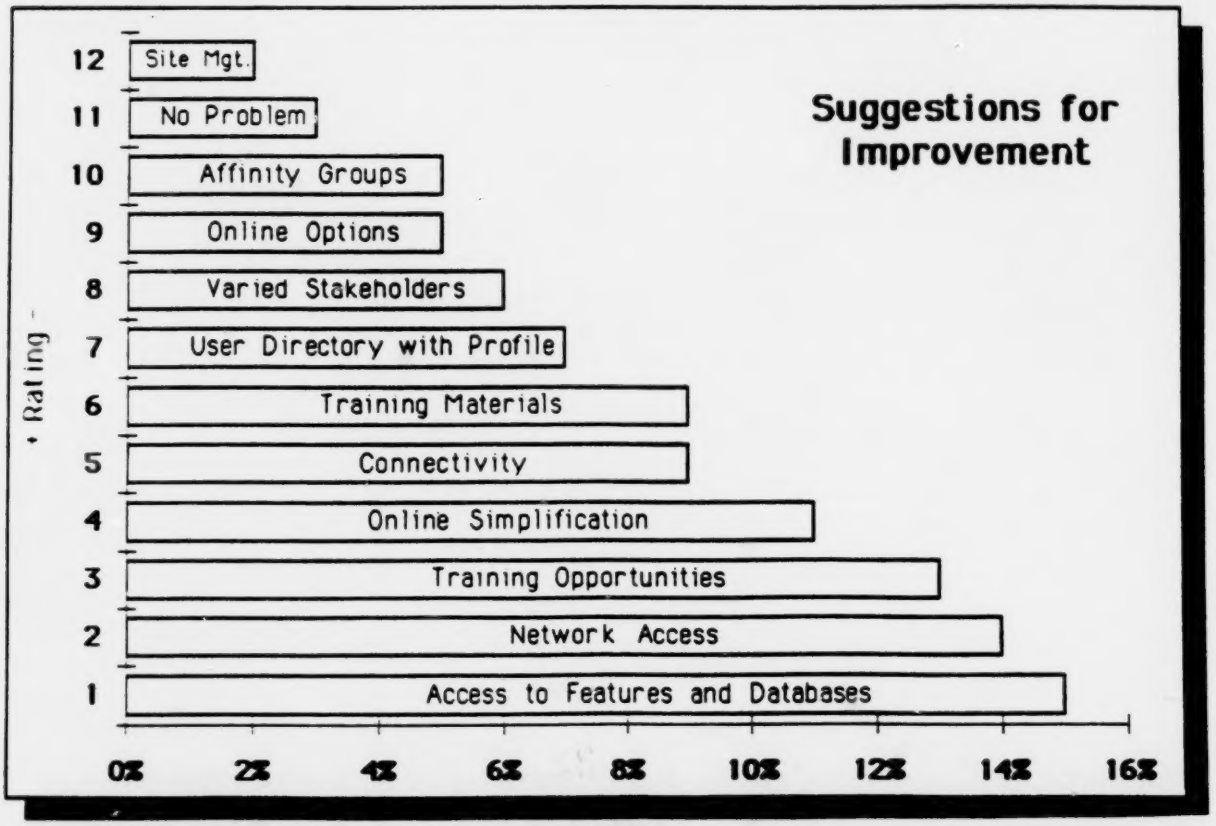
The total number of respondents making suggestions for improvement was 148. There was substantial interest in enlarging the range of options available to TENET users and by expanding those already available, e.g., expanded library privileges, access to more library resources, unrestricted access to Internet. Of nearly equal importance was the question of getting access to the network host.

The second most common group of comments were training-related, including increased training and simplified online procedures which would require less sophisticated training in order to navigate the system. These requests, coupled with connectivity questions such as being able to get phone lines and hardware, are from users who appear to be struggling with their TENET use.

The third most common collection of responses dealt with which stakeholders are online and the quality of interaction with them. Included here is the desire of users to have TENET availability for anyone with whom they might want to converse. A handful of respondents suggested improvements which are actually presently available on TENET, but which their level of experience had not allowed them to know the availability of the options.

Possible further study: Compile a management document by further categorizing responses. It might also be appropriate to submit such a list to users, measuring their importance as changes or additions for TENET management to consider by role group.

Chart 9



Survey Item #10:

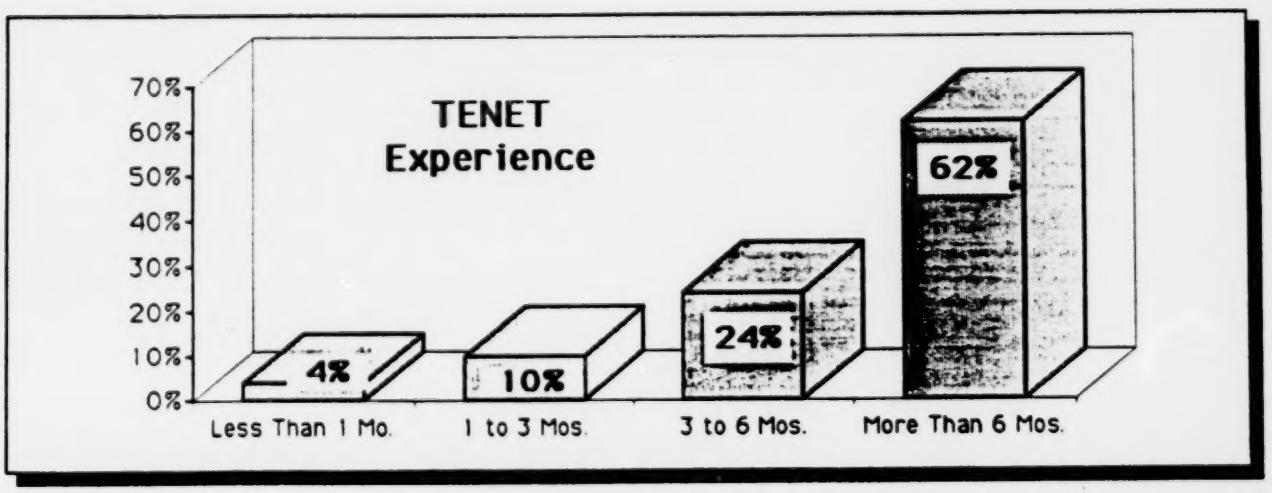
How long have you been using TENET?

4%	A.	less than 1 month
10%	B.	1 to 3 months
24%	C.	3 to 6 months
63%	D.	more than 6 months

With the network availability beginning in the 1991-92 school year, the data support how quickly large numbers of people began using the communications network. There was virtually no difference in results between the first wave of responses to the survey and the second wave, despite the fact that they were separated by four months. About 14% are relatively new users (less than three months experience) at any point in the year and about 87% appear to be finding the network useful enough to continue accessing its offerings.

Possible further study: Explore the responses to Item #8 and #2 relative to the respondents' TENET experience.

Chart 10



Survey Item #11:

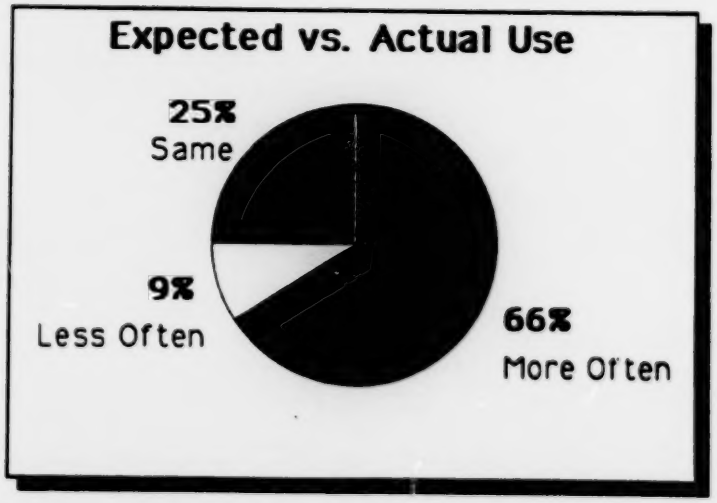
How often do you use TENET now compared to what you expected when you signed up for the network?

66% A more often
9% B less often
24% C about the same

The responses to "A" appear to be driven by the relative ignorance of potential users regarding the possibilities for use available to them on TENET. The anecdotal data supplied in response to other items is clear about how startled new users are with the amount of information and extent of options for them. There is no way for them to know the number of hours they might end up spending exploring INTERNET resources, for example. Inquiries were sent online to all "B" respondents who identified themselves All replied to the inquiry citing logistics, connectivity or extenuating personal circumstance as the reason for the response. None of the respondents indicated that their reduced use was a function of disinterest or disenchantment with TENET.

Possible further study Explore the rationale of "C" respondents. This potentially could be the group of users who might eventually drop off the system. They might, however, just be a portion of the 32% of the users who indicated that they were frequent users of other networks and bulletin board systems and, therefore, not naive or ignorant of the use and time quotients which they would bring to TENET participation.

Chart 11



33

TENET IN THE LARGER CONTEXT

Deneen Frazier, M Ed
AtWork Networks

National Context

Over the past decade, there has been a tremendous surge in the growth of technologies which make electronic communication more affordable, accessible and worthwhile With these technological advances--increases in modem and processor speeds, seamless software programs, and more interconnection between networks--the public now has direct access to a new world of communication which traditionally has been inhabited only by higher education and research sectors

Middle class America is now the targeted market for public networks and services By subscribing to public networks like Prodigy, CompuServe and AT&T Mail, consumers can make their everyday lives easier For example, with CompuServe, you are able to make flight reservations using the OAG Guide, complete banking transactions, and check a stock's status on the Dow Jones, all from your home computer In essence, the technology is so accessible that it is making everyone think about how to live their lives differently

While this increase in growth and interest was occurring on the consumer front, the education sector has been in a "watch & observe" mode Historically, educators have always been reluctant to adopt new technologies primarily due to a great lack of budgetary and time resources In fact, it is a rather recent development that educators have embraced the computer as an effective tool to advance student learning Unfortunately, most teachers have received only limited training on how to utilize the capabilities of the computer to enhance instruction The thought of adding telephone lines to these computers has often overburdened those educators who actually get excited about technology and learning

While this picture may seem overwhelming, there does appear to be a promising future In the fall of 1992, Vice President-elect Gore sponsored the passage of S 272, a bill known as the National High Performance Computer Program This legislation will allocate $2 9 billion over five years across a number of governmental agencies to connect the nations' colleges, universities, and libraries to NREN, the National Research and Education Network This is an existing network that will now begin to involve the K-12 educational sector and move toward the goal of building a "national superhighway" With this increase in national attention and funding, ed' ators all around the country will be able to incorporate telecommunications more into everyday school life

State Context

The experiences with technology and approaches to creating a statewide network vary dramatically for every state However, based on several surveys conducted within the past several years (McAnge, 1990 & Kurshan, 1990), it is clear that every state is moving toward or currently does support some type of network structure These networks include instructional television, satellite, and telecomputing networks, the last of which is describes TENET

Until about five years ago, most of the telecomputing networks were supporting only administrative tasks. With the advent of user-friendly spreadsheet and database applications, state-level administrators realized that the transfer of the local budget and administrative information could be handled electronically. For example, student records could be transferred electronically to all schools and Superintendents' budgets could be sent electronically to the state controller. While both of these electronic transfers reduced the amount of time and paperwork necessary to complete the clerical task, the power of the network is only just being realized by the principals, secretaries and counselors.

As the administrative use of telecomputing advanced, classroom teachers began to explore how student learning experiences could be enhanced through the powerful tool of electronic communication. Utilizing telecommunications for instructional purposes has been viewed as an "add on" feature to some statewide networks with very little outreach to the classroom teachers. Even today, school districts have benefited from only minimal exploration by an ad hoc collection of isolated educators rather than taking a systemic approach to the use of technologies for multiple purposes and stakeholders.

As is shown by the two surveys mentioned above, 33 states currently support an existing network at some level. Thirteen states had proposed networks at the end of 1991. Within a number of states, there are a variety of programs which may involve only one school site or district. These would include National Geographic's Kidsnet which links individual classes around the country or Hawaii's Global Teleclass which links Hawaii's students with students internationally to develop language skills. Within the 33 existing statewide networks, there are a core nine states which are recognized nationally as the leaders in the field. These states are Arizona, Florida, Nebraska, Indiana, New Mexico, Pennsylvania, Texas, Virginia, and West Virginia. These are the states that other states entering into planning and pilot phases of their own networks will use as models for their own growth and development.

Comparable State Efforts

For the purposes of the TENET evaluation, four of the remaining eight states were chosen from the core group as benchmark networks which would serve as strong bases of comparison. These states and their respective networks are:

- Florida (FIRN)
- Pennsylvania (PENN*LINK)
- Virginia (VA-PEN)
- West Virginia (WVMEN)

These networks were chosen as the benchmarks by which to measure TENET's strengths and weaknesses due to their similarities in scale or size and intended reach. All these networks service their entire respective states, are utilized by educators and are at least partially subsidized by the state government. Given these broad similarities, these networks are unique in that they were started to serve different functions and different populations by using different training and technical assistance models. Table 2 and Table 3 highlight major services and features of statewide telecomputing networks with a comparison TENET and the other networks. Table 2 summarizes the major similarities and differences while Table 3 provides the detailed information from which the summary has been drawn.

Table 2

SUMMARY OF MAJOR SIMILARITIES AND DIFFERENCES BETWEEN TENET AND FOUR STATE TELECOMPUTING NETWORKS

MAJOR SIMILARITIES	COMMENTS
Internet Gateway	Only one network has yet to add the Internet as a service. This is a key component which should be upgraded in any way possible (e.g., advanced search programs, etc.)
Staffing	TENET currently supports about the same size staff as three other networks but services approximately twice the number of users
Software	Although TENET operates a variety of software (PINE, USENET, CAUCUS) which is different from a prevalent popular choice of DEC's "All In One," the goal is the same: to provide users with the ability to navigate through electronic mail, bulletin boards and conferences.

MAJOR DIFFERENCES	COMMENTS
Budget Amount	TENET's current annual budget ($1,247,000 in 1992) demonstrates a high level of state commitment. The only state which has made a more substantial commitment is Florida, with a budget eight times that of TENET to support a multi-use network serving half as many users.
Outreach Activities	Only TENET and FIRN have developed formal activities designed to obtain new users.
Training Delivery	TENET is the only network which uses trainers from multiple stakeholder groups.
Number of Users	TENET is approximately double the size of any other existing statewide network.
Intended Audience	TENET has attracted users from multiple stake-holder groups (VA and WV make it available but do not encourage it with the outreach activities)
Cost to User	TENET charges a minimal fee of $5.00
Intended Purpose	TENET is the only network which places equal importance on instructional and administrative use of the network.
Authorizing Entity	TENET is the only network which has been legislated into action.

TABLE 2: COMPARISON OF TENET TO FOUR STATEWIDE TELECOMPUTING NETWORKS

NETWORK FEATURES	TENET (Texas)	PENN*LINK (Pennsylvania)	FIRN (Florida)	VA-PEN (Virginia)	WVMEN (West Virginia)
AUTHORIZING ENTITY	State Legislature	Dept. of Education (in partnership with Penn State University's Department of Agriculture Extension Service)	Department of Education	Department of Education	Department of Education
INTENDED PURPOSE	Instruction & Administration	Administration	Instruction & Administration	Administration	Training & Instruction
INTENDED AUDIENCE	Administrators, Teachers, Students Any community member demonstrating an interest in education	Superintendents They can also maintain additional accounts for teachers and librarians	Teachers, Adminstrators Higher Education - new audience includes only a few professors & students	Administrators, Teachers, Students Any community member demonstrating an interest in education	All West Virgina residents (particularly teachers, students, parents, business)
SERVICES	Online Messaging Conferencing Internet Gateway File Transfer Database Access CNN Classroom Cleveland FreeNet Gateway Reference Tools List Serves	Online Messaging Bulletin Boards Internet Gateway File Transfer Database Access CNN Newsroom Satellite Learning Program Schedule Legal Case Summaries Accessible by other government agencies	Online messaging Bulletin Boards Internet Gateway File Transfer Interfaces with other networks Database Access Newsweek Education Program CNN Newsroom	Online Messaging Conferencing Internet Gateway (most servers) File Transfer Interfaces with other networks Newsgroups	Online Messaging Conferencing Bulletin Boards Courses (college-level)
DESIGN OF TRANSPORT SYSTEM	Planning Phase: First Planning Mtg. - Fall, 1990 Network Online - Aug., 1991 Hardware: Utilizing existing inter-university network: local UNIX hosts Local and 800* access is supported. Software: PINE Mail System USENET News & Conferencing	Planning Phase: First Planning Mtg - 1981 Pilot Phase - 1981-1984 Network Online - Nov., 1986 Hardware: Utilizing existing nodes all across the state 2/3 of state use local call access Software: All-in-One (DEC)	Planning Phase: First Planning Mtg. - 1977 Network Online - 1982/1983 Hardware: Utilizing existing hardlines of universities, community colleges, local school networks Software: All-in-One (DEC)	Planning Phase: First Planning Mtg. - May, 1989 Network online - Fall, 1990 Hardware: 48 servers across the state Use existing inter-university network Software: USENET News & Conferencing	Planning Phase: First Planning Mtg. - 1981 Network online - 1983 Hardware: LAN's (Novell) connected to six nodes Accessible by 4 toll-free and 2 local lines Software: RBBS (Remote Bulletin Board System)

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NETWORK FEATURES	TENET (Texas)	PENN*LINK (Pennsylvania)	FIRN (Florida)	VA-PEN (Virginia)	WVMEN (West Virginia)
USER REQUIREMENTS USER COSTS	All user platforms are supported. Cost to user: $5 per year $25 per year for independent schools and post-secondary accounts	All user platforms are supported. Cost to user: $25 one-time set-up fee ($225 for those outside the school system) $11/hour $315 - Average annual usage charge	All user platforms are supported Cost to user: None	All user platforms are supported. Cost to user: None	All user platforms are supported. Cost to user: None
DELIVERY OF TRAINING	Train the trainer model Master trainers (50) were identified at Regional Service Centers, State Department of Education, and educational organizations to train others at the local and state levels	Network Field Coordinators (29 total) are employees of Pennsylvania's Intermediate Units	2 FIRNSOL's (Support for Online Learning) 10 FIRNTEC's (Technical Education Consultant) Coordinate group and one-on-one training Summer Training Workshops providing certification credit	Local inservices coordinated by certified trainers.	"Train the trainers" model. Spent first few years of network implementation holding many workshops all around the state. In its tenth year most local sites have a trainer available or receive training from other affinity groups.
USER ENROLLMENTS (as of 11/92)	Approx. 15,000 users	Approx. 800 users Only 4 LEA's do not have accounts 90% of all accounts are used each week	Approx. 5,000 users 50 new accounts processed per day	6,000 users	7,000 users (as of 11/92)
STAFFING	2 Full-time (paid by Dept. of Education) 1 Full-time and 3 part-time to answer support line (paid by University of Texas)	3 Full-time (paid by Dept. of Education) All invoicing is done by Penn State Univ.	2 Full-time Clerical 1 Full-time to answer 800* Help Desk 1 Student (1/2 day)	11 Nodes supported by 2 volunteers (technical administrator and instructional facilitator)	5 Full-time
TECHNICAL SUPPORT	Regional education service centers and district level trainers work in tandem to provide support. Online help message box Direct help line (avail. normal business hours)	Field trainers are given workshops two times a year with updated materials 3-tiered support structure: 1. Field trainer 2. Online "Professor" 3. Direct call to Dept. of Education	2 FIRNSOL's 10 FIRNTEC's 800* Voice Help Line	Each node supports its own group of users.	8 technicians hired by DOE to cover 8 regional areas of state

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NETWORK FEATURES	TENET (Texas)	PENN*LINK (Pennsylvania)	FIRN (Florida)	VA-PEN (Virginia)	WVMEN (West Virginia)
FUNDING SOURCE(S) BUDGET AMOUNTS	Fully supported by Dept. of Education 1991 - $1.17 million 1992 - $1.25 million	Subsidized by the state at 60% $70,000 per year for network subsidy (does not include 3 full-time staff)	Fully supported by Dept. of Education 1987-1990 - $8,606,284 (each year) 1990-1991 - $7,286,851 1991-1992 - $5,633,042	Fully supported by Dept. of Education 1992 - actual figures not available	5 Different Funding Sources 1992 - $150,000
OUTREACH STRATEGIES	Affinity groups Trainer coordinated workshops Videoconferences	Demonstrated to audience the reduction of cost with use of e-mail	Yellow Pages - hard copy directory of users Ed. Tech. News - bimonthly newsletter Instructional Resource Guide Flyers of new programs	One teleconference Two symposia Word of mouth	Word of mouth
FUTURE PLANS	Continue to decentralize the network by expanding the reach of the network to the nodes at actual local schools	Teacher Pages - Read only bulletin board Pennsylvania is moving toward outcome-based education which may push the network to include an instructional focus	CD-ROM Project - for Hospital/ Homebound students FASTER system - transfer of student records Conferencing	In early 1993, network operations will be centralized in Richmond. Additionally, the infrastructure of the network will be broadened to include instructional capabilities, called the 'Academical Village'	Internet Gateway Investigating the use of a packet-switching network

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Conclusions

If TENET is to maintain its role as a leader in statewide telecomputing and, as a result, in making revolutionary changes in instructional collaboration and student learning, the network's weaknesses must be recognized and appropriate changes made. The following is a list, in priority order, of the conclusions reached as a result of this study.

Maintain close relationship with NREN developments

With the involvement of TENET's director with the Consortium for School Networking (CoSN), the experiences of TENET are playing a significant role in the development of the "national superhighway." Since TENET is the network which most clearly is dedicated to supporting teachers and students, it is critical to continue voicing this approach as the NREN develops and grows.

Monitor hardware and software capacities

With the rapid increase in numbers of users, the capacity levels of current hardware and software must be monitored and upgraded early in advance of educator demand. Otherwise, it is predictable that users will turn away or become disillusioned quickly once they are not able to dial in due to an overload on the incoming lines. Due to the distributed structure of TENET, users will be best served by the development of software which simulates the work done by network software like "All In One" on the user's desktop computer. This will provide a more "user friendly" and beneficial environment.

Provide both links between local area and wide area networks

Research the linking of local area networks to wide area networks. The network cannot scale up as an individual computer, modem and phone line situation. TENET has helped illustrate the need for local communication as well as wide area communication.

Monitor levels of technical support & training

Ensure that levels of support and training remain consistent as the number of users continues to increase at dramatic rates. TENET is by far the largest educational state network, but size, in and of itself, will not automatically continue the benchmark status it currently enjoys. During the first year of operation, training and support concentrated on orienting the user to the system. In the coming years however, users' needs will command training at a number of complex levels which will include not only orientation but also Internet gatewaying for example.

Provide new opportunities for discussion between multiple stakeholders

One of the significant and exciting differences between TENET and any other state network is the focus on collaboration among multiple stakeholder groups. Currently, TENET's trainers represent a variety of educational roles and education-related organizations. Unfortunately, the current interaction is focused on accessing information, especially the information of the affinity groups. Over time, it will be more important to increase the level of dialogue and the sharing of information which TENET could foster with the development of new strategies.

Increase current staff size

TENET is currently operating with 2 full time staff people (including the director) to service 15,000 users. While this staff size is commensurate with the other comparable statewide networks, TENET supports almost double the number of users on those same networks.

Create a governance model

The size of TENET, its rapid growth, exponential changes in technology, the decentralized structure of the development and operations of the network, the multiple stakeholder trainer model and the number of agencies, organizations and institutions using the system, suggest that a flexible, quick response governance system needs to be established. To do this, the director of the network needs to have a closer working relationship with the developer and operational contractors. The governance model needs to foster an interactive collaborative relationship between network management and governance structures which include active participation by all network stakeholders.